

Aerodynamics and Hydrodynamics in Sports

Overview

The winning time-margins are progressively being reduced with the integration of advanced technologies in all competitive sports. Nevertheless, the time margin can be further decreased by applying aero/hydrodynamic knowledge. For example, in cycling, swimming, skiing and speed skating athletes used biological power to overcome drag generated by air and water. Minimisation/optimisation in aero/hydrodynamic drag can significantly improve an athlete's performance. Similarly, the optimisation of shape and surface design of sports balls and projectiles can ultimately enhance athlete's overall performance in competitive sports.

The basic aerodynamic and hydrodynamic principles that govern most speed sports will be covered in this short course. Each concept applied to a wide variety of individual sports, demonstrating how surface textures, form and shape of the equipment or athlete govern speed and motion and ultimate performance will be dealt with. The effects of these specific mechanisms on the behaviour and performance of sports equipment and athletes will be elaborated. The aerodynamics and hydrodynamics of several different sports will be discussed with the help of recent wind tunnel measurements, computational modelling and theoretical analyses.

The course will be delivered by an internationally acclaimed academic, researcher and practitioner with proven knowledge, experience, and demonstrable ability in teaching, consultancy, research, and training in the field of Sports Engineering and Sports Technology.

Dates	3rd April to 8th April 2017	
Location	Motilal Nehru National Institute of Technology (MNNIT) Allahabad, U.P., India.	
Course Schedule		
3 rd April 2017 (Monday)	Inauguration: 3.30 PM-4.00 PM Topic: Introduction to Aerodynamics & Hydrodynamics. Lecture-1: 4:00 PM –5.00 PM Tea Break: 5.00 PM-5.15 PM Lecture-2: 5.15 PM-6.15 PM Lecture-3: 6.15 PM – 7:15 PM	
4 th April 2017 (Tuesday)	Topics: Aerodynamics of spherical and oval shaped balls Lecture-4: 4:00 PM –5.00 PM Tea Break: 5.00 PM-5.15 PM Lecture-5: 5.15 PM-6.15 PM Lecture-6: 6.15 PM – 7:15 PM	
5 th April 2017 (Wednesday)	Topic: Aerodynamics of sports equipment Lecture-7: 4:00 PM –5.00 PM Tea Break: 5.00 PM-5.15 PM Lecture-8: 5.15 PM-6.15 PM Tutorial & Discussion:6.15 PM – 6:45 PM	
6 th April 2017 (Thursday)	Topics: Aero/hydrodynamics of sports Lecture-9: 4:00 PM –5.00 PM Tea Break: 5.00 PM-5.15 PM Lecture-10: 5.15 PM-6.15 PM Tutorial & Discussion:6.15 PM – 6:45 PM	
7 th April 2017 (Friday)	Topics: Aerodynamics of skiing and bio-mimicking in sports Lecture-11: 4:00 PM –5.00 PM Tea Break: 5.00 PM-5.15 PM Lecture-12: 5.15 PM-6.15 PM Tutorial & Discussion:6.15 PM – 6:45 PM	
8 th April 2017 (Saturday)	Evaluation of Learning Outcomes (Examination/Test, Feedback) & Certificate distribution. 10.00 AM-12.30 PM.	

Who should attend?	UG and PG Students, Research scholars, Faculty members, Practicing Engineers, Scientists, Sports personnel, Sports trainers and Sports enthusiastic.								
Prerequisites	An undergraduate degree in engineering or a technical background is recommended. Attendees having taken an undergraduate or graduate course in basic Fluid mechanics and/or Aerodynamics is preferable.								
Course Fee	<p>One-Time GIAN Registration: Visit http://www.gian.iitkgp.ac.in/GREGN/</p> <p>The participation fees for attending the course is as follows:</p> <table border="1" style="width: 100%;"> <tr> <td>Participants from abroad:</td> <td>US\$ 200</td> </tr> <tr> <td>Industry/ Research Organizations:</td> <td>Rs. 5000</td> </tr> <tr> <td>Academic Institutions (Faculty members):</td> <td>Rs. 3000</td> </tr> <tr> <td>Academic Institutions (Students):</td> <td>Rs. 1000</td> </tr> </table> <ul style="list-style-type: none"> The above fee includes all instructional materials, computer use for tutorials & assignments (if any). Minimum 90% attendance necessary to be eligible for certificate of participation/attendance. Appearing for evaluations/examinations during the course is necessary for certificate of grades in the course. Accommodation in the campus can be provided subject to availability and on 'first come first served' basis. 	Participants from abroad:	US\$ 200	Industry/ Research Organizations:	Rs. 5000	Academic Institutions (Faculty members):	Rs. 3000	Academic Institutions (Students):	Rs. 1000
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Academic Institutions (Students):	Rs. 1000								
Bank Details	<p>Account Name: CAHS-2017. Account No.: 718400301000232.</p> <p>Bank Name: Vijaya Bank. Branch: MNNIT Allahabad. U.P. India.</p> <p>IFSC Code: VIJB0007184.</p> <p>Last Date of Registration: 27th March 2017.</p>								

International Expert



Professor Firoz Alam completed his Ph.D. in Road vehicle aerodynamics and Aero-acoustics from RMIT University, Melbourne, Australia in 2001. He completed M.Sc. (combined with Bachelor's degree) in Aeronautical Engineering with 1st class Honours (First Class First) from Riga Civil Aviation Engineers Institute, Latvia, 1991. Dr Alam joined the School of Aerospace, Mechanical and Manufacturing Engineering at RMIT University as Lecturer in January 2002. He was promoted to Senior Lecturer in 2006, Associated Professor in 2011 and full Professor in 2015. In addition to teaching and research responsibilities, Prof Alam has been serving

as Program Director for Mechanical Engineering at RMIT University over 10 years. He has been heavily involved in teaching, research and administration. His primary research interest is in experimental, computational thermodynamics and aerodynamics. His specialisation includes sports aerodynamics, aerodynamics of aircraft, road vehicles, trains, buildings and wind turbines, thermal engineering, energy policy and engineering education. His sports aerodynamics research includes sports balls, recreational and racing bicycle helmets, sports garments, ski jumping, alpine ski, and sports equipment. Prof Alam has supervised over 10 PhD students as principal supervisor. He is supervising 6 PhD and 2 Masters by Research students as principal supervisor specialising in aerodynamics, thermodynamics and engineering education. He has undertaken over 10 aerodynamics and energy related commercial projects with General Motors-Holden (GMH), Ford Motor Company, Queensland Rail, Breeze Air, Freight Link, Neopurple, SCT Logistics, National Pacific Rail and ACI logistics. Prof Alam has established RMIT University's Sports Engineering Research Group predominantly focuses on sports aerodynamics, clothing aerodynamics and thermal comfort. Additionally, he is also involved in Industrial Aerodynamics Research focusing on wind turbine aerodynamics, road vehicle aerodynamics, micro air vehicle aerodynamics and train aerodynamics. Prof Alam has been leading a large research project (over 1.2 million dollar) on energy conservation funded by the Ministry of Power, Energy and Mineral Resources, Bangladesh and the Australian Federal Government. Professor Alam has been awarded numerous awards including RMIT University Teaching Award, Emerging Researcher Award, Visiting Research Fellowship at Princeton University and NASA. Currently he is serving as a member of the Editorial Board for

Sports Engineering, published by Springer, assessor of Australian Research Council (ARC) and European Research Council (ERC). He is also serving as external invited referee for Journals such as Nature, National Geographic, Computers & Fluids, Energy and Buildings, Building and Environment, Applied Thermal Engineering, Wind Engineering and Industrial Aerodynamics, Sports Engineering, Sports Technology, Sports, Medicine and Science, Sports Science, Applied Biomechanics, Fuel, Powder Technology, European Journal of Engineering Education, Experimental Thermal Fluid Science, etc. Prof Alam has delivered invited keynote papers at many conferences. He has published over 150 scientific publications as book, book chapters, journal articles and conference papers. His research in applied aerodynamics and thermodynamics has notable impact and has been widely reported by the print and electronic media worldwide. Prof Alam has chaired and organised major international conferences and Scientific Committees. He was the organising Chair of 19th Australasian Fluid Mechanics Conference (AFMC2014) and 1st International Conference on Energy and Power (ICEP2016). He was also Co-Chair of the 4th APCST2009, held in Honolulu, USA in 2009 and 5th APCST2011 held in Melbourne in 2011. He has chaired aerodynamics, thermodynamics, and heat transfer sessions of a range of international conferences. He is also an active member of the International Advisory Committee for ICMIEE, ICTE and ICMERE.

Host Faculty:



Dr. Akshoy Ranjan Paul is Assistant Professor in the Department of Applied Mechanics, Motilal Nehru National Institute of Technology Allahabad (India). Dr. Paul has 15 years of combined teaching and research experience and is actively involved in research in the areas of fluid mechanics, especially flow through complex ducts and conduits, and measurement of turbulent flows therein. He obtained his Ph.D. in Aerodynamics in 2013 from MNNIT Allahabad. He has published 16 papers in international journals including a few in refereed journals, and 50 papers in conferences at various national and international levels. Besides, he has written four textbooks on fluid mechanics and solid mechanics for undergraduate level students. Five Ph.D. students are presently working under his guidance. Besides, he has guided 25 M.Tech. theses. Dr. Paul is a panel reviewer of three international journals and is presently working in three research projects from various Govt. Agencies in the area of Fluid Dynamics as an investigator. Dr. Paul was the Organising Secretary of 6th International & 43rd National Conference on Fluid Mechanics and Fluid Power (FMFP-2016).



Prof. Anuj Jain is Professor in the Department of Applied Mechanics, Motilal Nehru National Institute of Technology Allahabad (India). He served as Head in this department during 2013-15 and as Dean (Research & Consultancy) during 2010-12. Dr. Jain has obtained his Ph.D. degree in multiphase flows through cyclone separators from IIT Roorkee. He has about 30 years of teaching and research experience. He has published over 80 research papers. Besides, he has co-authored one textbook on Strength of materials for undergraduate level students. Four students have been awarded Ph.D. degree under his guidance so far. He has guided 63 M. Tech. theses. Prof. Jain is presently working on two externally funded research projects in the area of Bio-Fluid Dynamics as the principal investigator. He conducts Faculty Development Programme on CFD regularly. His current research interests include application of CFD for various challenging problems. Prof. Jain was the Chair of 6th International & 43rd National Conference on Fluid Mechanics and Fluid Power (FMFP-2016).

Contact:

Principal Course Coordinator	Course Coordinator	Local GIAN Coordinator
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